Structure of atom (Chemistry)
Holiday H.W Class XI

Q.1 Calculate the wave no. for the longest wavelength transition in the Balmar series of atomic hydrogen
Ans $1.52 \times 10^{6} m^{-1}$

Q.2 Calculate the wavelength for emission transition if it starts from the orbit having radius 1.3225 nm and ends at 211.6 pm. Name the series to which the transition belongs and the region of the spectrum Ans 434 nm

Q.3 Arrange the following type of radiations in increasing order of frequency 1) Radiation from microwave oven 2) Amber light from traffic signal 3) Radiation from FM radio 4) Cosmic rays from outer space 5) X-rays

Q.4 wavelengths of different radiations are given below
$\lambda(A) = 300 nm$, $\lambda(B) = 300 \mu m$ $\lambda(C) = 3 nm$, $\lambda(D) = 30 Å$
Arrange these radiations in the increasing order of their energies.

Q.5 The mass of an electron is $9.1 \times 10^{-31} kg$. If its K.E is $3 \times 10^{-25} J$ then calculate its wavelength (Ans 8967 Å)

Q.6 The work function (W_0) of some metals is listed below Count the number of metals which will show photoelectric effect when light of 300 nm wavelength falls on metal

Metal	Li	Na	K	Mg	Cu	Ag	Fe	Pt	W
W_0 (ev)	2.4	2.3	2.2	3.7	4.8	4.3	4.7	6.3	4.75

Q.7 What transition in the hydrogen spectrum would have same wavelength as the Balmar transition $n=4$ to $n=2$ of He^+ spectrum? (Hint use formula $\bar{\nu} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

Q.8 When electromagnetic radiation of wavelength 300 nm falls on the surface of sodium, electrons are emitted with K.E of $1.68 \times 10^5 J mol^{-1}$. What is the minimum energy needed to remove an electron from sodium? What is the maximum wavelength that will cause photoelection to be emitted? (Ans 517 nm)

Q.9 Calculate the energy associated with the first orbit of He^+. What is the radius of this orbit? (Ans 0.026 nm)

Q.10 Emission transitions in the paschen series end at the orbit $n=3$ and starts from orbit n and can be represented as $\nu = 3.29 \times 10^{15} (Hz) \left(\frac{1}{3^2} - \frac{1}{n^2}\right)$. Calculate the value of n if the transition is observed at 1285nm. Find the region of the spectrum ($n=5$, IR)

Q.11 What is photoelectric effect? State the result of photoelectric effect experiment that could not be explained on the basis of laws of classical physics. Explain this effect on the basis of quantum theory of electromagnetic radiations.

Q.12 What are the postulates on which the Bohr theory of the structure of the hydrogen atom is based?

Q.13 A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1 Å. What is the uncertainty involved in measurement of its velocity?

Q.14 What is the total number of orbitals associated with principal quantum no. $n=4$?

Q.15 The arrangement of orbitals on the basis of energy is based upon their $(n+l)$ value. Lower the value of $(n+l)$, lower is the energy. For the orbitals having same values of $(n+l)$, the orbitals with lower value of n will have lower energy

1) Based upon the above information, arrange the following orbitals in the increasing order of energy

a) 1s 2s 3s 2p b) 4s 3s 3p 4d

c) 5p 4d 5d 4f 6s d) 5f, 6d, 7s, 6p

2) Based upon the above information, solve the questions given below

a) Which of the following orbitals has the lowest energy? 4d, 4f, 5s, 5p

b) Which of the following orbitals has the highest energy? 5p, 5d, 5f, 6s, 6p

Q.16 Indicate the number of unpaired electrons in

i) P ii) Si iii) Cr iv) Fe v) Kr

Q.17 Write the electronic configurations of the following ions

a) H^- b) Na^+ c) O^{2-} d) F^-